PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
P 470003 WO		

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2004/003293	29.03.2004	27.03.2003

International Patent Classification (IPC) or national classification and IPC
B60K41/14

Applicant
TOROTRAK (DEVELOPMENT) LIMITED et al.

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 1 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
20.07.2004	19.11.2004

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/003293

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-40	as originally filed

Claims, Numbers

1-16, 17 (part), 23-43	as originally filed
17 (part), 18-22	received on 20.07.2004 with letter of 19.07.2004

Drawings, Sheets

1/13-13/13	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-43
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-43
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-43
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Subject: Method of controlling a continuously variable ratio transmission (further: cvt) of the "torque controlled" type.

Closest prior art: US-A-5,521,819 discloses a transmission of this type and its control method

Problem: engine speed control in the torque controlled type of cvt is not straightforward, since other than in a ratio controlled cvt there is no direct way to establish a relationship between vehicle speed and engine speed (not the cvt speed ratio is controlled, but the torques at input and output are). With the torque controlled cvt engine speed will be influenced by the net imbalance between torque generated by the engine and torque exerted on the engine by the transmission. The problem is to preclude the engine speed from varying in an uncontrolled manner-i.e. to find a way to manage such a torque imbalance

Solution: by controlling the engine while taking into account the mentioned effect, that is, by attempting to attain a target engine speed acceleration and control torques of cvt and/or engine torque accordingly (claim 1), or by directly controlling torques of cvt and/or engine torque according to the calculated torque necessary to accelerate the drive train to attain the targeted engine speed acceleration (claim 17) or by supplying the engine speed error to a closed loop controller controlling the net torque required to reduce the engine speed error and allocating this required control effort to adjusting engine torque and adjusting torques of cvt, taking into account the control effort involved (claim 29).

The features claimed in combination are not known from any of the available prior art. The problem overcome by the claimed solutions is not addressed in the prior art, so that the solutions can be seen to involve an inventive step.

Thus claims 1, 17 and 29 and dependent claims 2 to 16, 18 to 28 and 30 to 43 meet the requirements of Articles 33(2) and 33(3) PCT.

adjusting the control signal to the variator and/or adjusting a torque controller of the engine such that engine torque is equal to loading torque applied by the transmission to the engine plus the excess torque TrqAcc, such that the excess torque acts upon the relevant power train inertia and causes engine acceleration.

18. A method as claimed in claim 17 wherein the construction and arrangement of the variator is such that torques exerted by the variator upon its input and output members is always proportional to magnitude of the primary control signal, for a given variator drive ratio.

19. A method as claimed in claim 17 wherein the construction and arrangement of the variator is such that the sum of the torques exerted by the variator upon its rotary input and output members is always proportional to magnitude of the primary signal control.

20. A method as claimed in any of claims 17 to 19 wherein the control signal takes the form of a difference between two hydraulic pressures.

21. A method as claimed in any of claims 17 to 20 wherein the target engine acceleration is calculated based on a difference between current and target engine speeds.

22. A method as claimed in any of claims 17 to 21 wherein target engine speed is set in dependence upon a user input.